

REMARKS

Claims 1- 7 are and under consideration pending in the above-identified application.

In the Office Action, Claims 1- 7 were rejected.

In this Amendment, Claims 1, 3 and 5 have been amended, and Claims 8 - 10 have been added. No new matter has been introduced as a result of this Amendment.

Accordingly, Claims 1 - 10 are at issue.

I. Objection to the Drawings

As requested by the Examiner, Applicants have amended FIG. 13 to include the legend “Prior Art.” No new matter has been added as a result of this drawing amendment.

Accordingly, Applicant respectfully requests withdrawal of this drawing objection.

II. 35 U.S.C. § 112 Indefiniteness Rejection of Claims

Claims 1 - 7 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Claims 1, 3, and 5 have been amended to clarify the invention, and Applicant submits that this claim amendment also mitigated the antecedent basis issues.

Accordingly, Applicant respectfully requests withdrawal of this claim rejection.

III. 35 U.S.C. § 102 Anticipation Rejection of Claims

Claims 1, 3 and 5 were rejected under 35 U.S.C. § 102(a) as anticipated by Figure 13 of the Instant Application which is “Prior Art”.

Applicant respectfully traverses this claim rejection.

Claim 1 is directed to vibration gyro circuitry.

In relevant part, Claim 1 recites:

“... the phase shift circuit sets a phase difference between the drive signal and the timing signal to be greater than 90 degrees on the basis of a phase difference characteristic of a detection sensitivity for the output signal of the differential amplifier circuit, the phase difference characteristic being obtained in advance under a condition where a rotational angular velocity is applied to the vibration gyro in a driving state.”

This is clearly unlike the teachings of FIG. 13 discussed in the Background Art Section of the Instant Application.

The Office Action asserts that FIG. 13 anticipates Claims 1, 3 and 5. However, FIG. 13 and/or any section of the Instant Application discussing FIG. 13 fails to teach or suggest that the phase shift circuit sets a phase difference between the drive signal and the timing signal to be greater than 90 degrees on the basis of a phase difference characteristic of a detection sensitivity for the output signal of the differential amplifier circuit, the phase difference characteristic being obtained in advance under a condition where a rotational angular velocity is applied to the vibration gyro in a driving state.

In fact, the Background Art section identified by the Office Action states that (emphasis added):

[0010]*The output signals of the piezoelectric element 33b and the piezoelectric element 33a corresponding to the drive signal are equal in phase and magnitude, and thus cancel each other in the differential amplifier circuit 4. On the contrary, the output signals of the piezoelectric element 33b and the piezoelectric element 33a corresponding to the Coriolis force are opposite in phase and equal in magnitude. Thus, the output signal of the differential amplifier circuit 4 is proportional to the difference between the output signal of the piezoelectric element 33b and the output signal of the piezoelectric element 33a, and only a signal corresponding to the magnitude of the rotational angular velocity is output from the differential amplifier circuit 4. The drive signal for driving the vibration gyro 31 and the output signal of the adding circuit 1 are in-phase and proportional in amplitude.*

[0011]*A Coriolis force develops in an orthogonal direction with respect to the direction of bending vibration corresponding to a drive signal. Therefore, a signal output from the differential amplifier circuit 4 corresponding to the Coriolis force, in principle, becomes zero at the maximum amplitude point of an output signal of the adding circuit 1 which is correlated (in-phase) with the drive signal, and becomes a maximum at the zero crossing point of the output signal of the adding circuit 1. This indicates that the output signal of the differential amplifier circuit 4 and the output signal of the adding circuit 1 are phase-shifted by 90 degrees. Accordingly, the synchronous detection circuit 5 is to detect the output signal of the differential amplifier circuit 4 at a timing of an output signal of the phase shift circuit 13 which has a phase difference of 90 degrees with respect to the output signal of the adding circuit 1.*

That is, FIG. 13 merely teaches that the output signal of the differential amplifier circuit 4 and the output signal of the adding circuit 1 are phase-shifted by 90 degrees. In turn, the synchronous detection circuit 5 detects the output signal of the differential amplifier circuit 4 at a timing of an output signal of the phase shift circuit 13 which has a phase difference of 90 degrees

with respect to the output signal of the adding circuit 1. This leads signal processing to be performed in accordance with a precondition that an output signal of the differential amplifier circuit 4 has a phase difference of 90 degrees with respect to an output signal of the adding circuit 1.

However, the phase difference between the output signal of the adding circuit 1 and the output signal of the differential amplifier circuit 4 may not necessarily be 90 degrees, due to factors attributable to the structure, material, and size of the vibration gyro 31. Therefore, in a vibration gyro having such a characteristic that the phase difference is other than 90 degrees, if the output signal of the differential amplifier circuit 4 is detected synchronously with a timing signal of the phase shift circuit 13 which is phase-shifted by 90 degrees from the output signal of the adding circuit 1, a detection sensitivity for the output signal of the differential amplifier circuit 4, i.e., the sensitivity of detection of a rotational angular velocity, cannot be maximized. In addition, since a noise does not vary significantly with the structure, material and size of the vibration gyro, an S/N ratio in detecting the rotational angular velocity is decreased.

In contrast, as illustrated in FIGs. 1, 5 and 7, the amount of a phase shift of the timing signal V_{ck} of the phase shift circuit 3 from the output signal V_{sa} of the adding circuit 1 is not fixed to 90 degrees, but is set in accordance with a phase difference θ_{ps} which is greater than 90 degrees and actually generated between the V_{sa} and the output signal V_{da} of the differential amplifier circuit 4. Moreover, this “greater than 90 degrees” phase difference is determined on the basis of a phase difference characteristic of a detection sensitivity for the output signal of the differential amplifier circuit, the phase difference characteristic being obtained in advance under a condition where a rotational angular velocity is applied to the vibration gyro in a driving state. Then, synchronous detection of the output signal V_{da} is carried out at a timing of the timing signal V_{ck} which is phase-shifted by the set phase difference θ_{ps} . This leads the phase shift circuit 3 to produce the timing signal V_{ck} , which is phase-shifted by θ_{ps} from the output signal V_{sa} and supplies to the synchronous detection circuit 5 the V_{ck} as the timing signal for synchronous detection.

This is simply not taught nor suggested in the Background Art that is described in Applicants’ specification.

Because, the Background Art fails to disclose all of the claimed limitations, Claim 1 is patentable, as are independent Claims 3 and 5, each of which recites the same distinguishable limitation as that of Claim 1.

Accordingly, Applicants respectfully request that these claim rejections 35 U.S.C. § 102(a) be withdrawn.

IV. 35 U.S.C. § 102 Anticipation Rejection of Claims

Claims 1, 3 and 5 were rejected under 35 U.S.C. § 102(b) as anticipated by Ebara et al. (“Ebara”) (U.S. Patent 6,608,425).

Applicant respectfully traverses this claim rejection.

Similarly to FIG. 13 of the Instant Application, Applicant submits Ebara also fails to teach or suggest “the phase shift circuit sets a phase difference between the drive signal and the timing signal to be greater than 90 degrees on the basis of a phase difference characteristic of a detection sensitivity for the output signal of the differential amplifier circuit, the phase difference characteristic being obtained in advance under a condition where a rotational angular velocity is applied to the vibration gyro in a driving state.”

In fact, Ebara states in relation to the phase-shift circuit, that:

“The signals generated in the two detection electrodes 2L and 2R are input to the differential circuit 7 and a differential signal is output. The differential signal corresponds to the Coriolis force. The differential signal is synchronously detected in the synchronous-detection circuit 8 by a synchronization signal input from the phase-shift circuit 17, smoothed in the smoothing circuit 9, amplified in the DC amplifier circuit 10, and output from the output terminal 12. Consequently, the phase-shift circuit 17, the differential circuit 7, the synchronous-detection circuit 8, the smoothing circuit 9, and the DC amplifier circuit 10 constitute a Coriolis-force detecting unit 11. Herein, the signal output from the output terminal 12 is called a Coriolis signal.”

That is, Ebara merely discusses the phase-shift circuit 17 is discusses as an component of a Coriolis-force detecting unit 11 to detect a Coriolis signal, but not as a component that sets a phase difference between the drive signal and the timing signal to be greater than 90 degrees on the basis of a phase difference characteristic of a detection sensitivity for the output signal of the differential amplifier circuit, the phase difference characteristic being obtained in advance under a condition where a rotational angular velocity is applied to the vibration gyro in a driving state, as required by Claim 1.

Because, Ebara fails to disclose all of the claimed limitations, Claim 1 is patentable, as are independent Claims 3 and 5, each of which recites the same distinguishable limitation as that of Claim 1.

Accordingly, Applicants respectfully request that these claim rejections 35 U.S.C. § 102(b) be withdrawn.

V. 35 U.S.C. § 103 Obviousness Rejection of Claims

Claims 2, 4, and 6 - 7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over either FIG. 13 of the Instant Application or Ebara in view of Kumada (U.S. 5,473,288).

Claims 2, 4 and 6 - 7, depend on Claims 1, 3 and 5, respectively, shown above to be patentable over both FIG. 13 of the Instant Application and Ebara.

Kumada is directed to an oscillation circuit and the disclosed phase-shift circuit 70 is configured to compensate a phase of a square-wave signal to provide a best phase for driving a vibrator. Thus, in Kumada the phase-shift circuit 70 is a component utilized the drive signal side of the oscillation circuit rather than on the detection signal side as is the case of the phase-shift circuit of Claims 1, 3 and 5 of the Instant Application.

Therefore, in addition to FIG. 13 of the Instant Application and Ebara, Kumada also fails to teach or suggest “the phase shift circuit sets a phase difference between the drive signal and the timing signal to be greater than 90 degrees on the basis of a phase difference characteristic of a detection sensitivity for the output signal of the differential amplifier circuit, the phase difference characteristic being obtained in advance under a condition where a rotational angular velocity is applied to the vibration gyro in a driving state” as required by each of Claims 1, 3 and 5.

Therefore, Kumada may not properly be combined with either FIG. 13 of the Instant Application or Ebara to render each of Claims 1, 3, and 5 unpatentable. As such, Claims 1, 3, and 5 are the cited references, taken singly or in any combination with each other, as are corresponding dependent Claims 2, 4, and 6 - 7, for at least the same reasons.

Accordingly, Applicants respectfully request that these claim rejections 35 U.S.C. § 103(a) be withdrawn.

VI. Conclusion

In view of the above amendments and remarks, Applicant submits that Claims 1 - 10 are clearly allowable over the cited prior art, and respectfully requests early and favorable notification to that effect.

If the claims are not found to be in condition for allowance, the Examiner is requested to contact the undersigned to schedule an interview before the mailing of the Office Action. Any communication initiated by this paragraph should be deemed an Applicant initiated interview.

Respectfully submitted,

Dated: June 29, 2009

By: /Kader Gacem/

Kader Gacem
Patent Agent, Registration No. 52,474
SONNENSCHN NATH & ROSENTHAL LLP
P.O. Box 061080
233 S. Wacker Drive
Chicago, Illinois 60606-1080
(312) 876-8000